than the approximately rectangle-shaped outline dimension OL defined by joining the inner edges of the plurality of electrodes 2 of the IC chip 1. The thermosetting resin sheet 6 cut in the rectangular sheet-like shape is sucked and held by a sticking head 642 pre-heated by a built-in heater 646 and stuck to the center portion of the region defined by joining the electrodes 5 of the circuit board 4. Next, the bumps 3 and the electrodes 5 of the circuit board 4 are aligned in position and, as shown in Fig. 45A and Fig. 46B, the IC chip 1 is pressurized with a pressure against the circuit board 4 by the heating tool 8 heated by the heater 8a so as to concurrently perform the correction of the warp of the board 4 and harden the thermosetting resin sheet 6 or the thermosetting adhesive 306b interposed between the IC chip 1 and the circuit board 4. At this time, the thermosetting resin sheet 6 or the thermosetting adhesive 306b is softened as described hereinabove by the heat applied from the bonding tool 8 via the IC chip 1 and flows outward by being pressurized from the position to which it has been stuck or applied as shown in Fig. 46C. This outflow thermosetting resin sheet 6 or the thermosetting adhesive 306b becomes an encapsulation material (underfill), which remarkably improves the reliability of the bonding of the bumps 3 to the electrodes 5. After a lapse of a specified time, the hardening of the

thermosetting resin sheet 6 or the thermosetting adhesive 306b gradually progresses, and the hardened resin 6s finally bonds the IC chip 1 to the circuit board 4. By moving up the bonding tool 8 that is pressurizing the IC chip 1, the bonding of the IC chip 1 to the electrodes 5 of the circuit board 4 is completed. Strictly speaking, in the case of thermosetting, the reaction of the thermosetting resin progresses during heating, and the fluidity almost disappears with the moving-up motion of the bonding tool 8. According to the above-mentioned method, neither the thermosetting resin sheet 6 nor the thermosetting adhesive 306b covers the electrodes 5 before bonding, and therefore, the bumps 3 are brought in direct contact with the electrodes 5 at the time of bonding. Then, neither the thermosetting resin sheet 6 nor the thermosetting adhesive 306b enters spaces under the electrodes 5, and the value of connection resistance between the bump 3 and the electrode 5 can be reduced. If the circuit board side is heated, then the temperature of the bonding head 8 can further be reduced. If this method is applied to the eighteenth embodiment, the bonding of the gold bumps to the gold electrodes (for example, copper or tungsten plated with nickel or gold) of the circuit board can easily be achieved.

(Twenty-First Embodiment)

A method and apparatus for mounting an electronic component of, for example, an IC chip on a circuit board and an electronic component unit or module of, for example, a semiconductor device in which the IC chip is mounted on the board by the mounting method, according to a twenty-first embodiment of the present invention will be described next with reference to Fig. 47 and Fig. 48. The twenty-first embodiment differs from the sixteenth embodiment in that high-reliability bonding can be achieved even if a bump 103 is mounted on the electrode 5 of the circuit board 4 while being shifted.

According to the twenty-first embodiment, as shown in Fig. 47A, a gold ball 96 is formed of a gold wire 95 by an electric spark similarly to the wire bonding in forming the bumps 3 on the IC chip 1. Next, a ball 96a of a diameter Φd-Bump denoted by 95a is formed while adjusting the size of the ball by the duration of the electric spark, and the thus-formed ball 96a of the diameter Φd-Bump is formed by controlling the parameter of time or voltage for generating the electric spark so that a chamfer diameter ϕD denoted by 93a of a capillary 193 whose chamfer angle θc is not greater than 100° becomes one-half to three-fourths the gold ball diameter d-Bump.

Instead of forming a bump 3 as shown in Fig. 47D with the provision of a flat portion 93b in the portion to